What to do when HPC-FaaS Problems Stare at Your Face?

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HPC Applications are Being Designed as DAGs

DAG execution on a serverless platform has both advantages and disadvantages
Challenge 1: Cold Starts are Always Problematic in Serverless Computing

The invocation of components follow a Weibull distribution in HPC DAGs

This characteristics enables to decouple warming up the function code from warming up the microVM (hot start).
Employ hot starting of components to reduce cost and service time
Challenge II: Scaling Overhead Can be a Significant Portion of Serverless Service Time

Service Time (Execution Time + Scaling Time) becomes worse with concurrency due to increased scaling time
Reduce Scaling Time by Packing Multiple Functions in a Function Instance

- Invoked Functions
- Functions Packed Inside Instances

Packing effectively reduces the number of instances to be spawned

High Scaling Time

Low Scaling Time
Determine the Optimal Packing Degree of Concurrent Function Invocations

With applying ProPack on FuncX, functions scale 22% faster than AWS Lambda for a concurrency of 1000
Challenge III: Serverless Functions Cannot Directly Communicate with Each Other

I/O time and cost can be significant
Production Serverless Platforms have Different Tiers of Storage Options

Opportunistically selecting different tiers of storage for different components of a DAG can improve I/O performance
Can we integrate these optimizations in Globus Compute – Federated Function as a Service?